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The primary purposes of the study were: (a) to determine which vegetables from a selected group of raw and cooked vegetables twenty-four preschool children selected to eat; (b) to determine the apparent amount of vegetables selected and the apparent amount of vegetables consumed by twenty-four preschool children; and (c) to determine the relationship which existed between the order of presentation of the vegetables and the amount of vegetables selected or consumed by the children.

Subjects for the study were the twenty-four three and four year old children enrolled in the University of North Carolina at Greensboro Nursery School during the 1966-67 school year.

A comprehensive study of foods selected and consumed by nursery school children was conducted for twenty consecutive school days. The children entered the dining room in random order each day and selected their lunch from the foods that had been randomly arranged in groups of raw vegetables, cooked vegetables, meats and meat substitutes, and desserts.

The cooked vegetables were measured and served in a standard tablespoon. Raw vegetables were served in the following amounts: carrots and celery, three two-inch strips; cabbage and spinach, one small leaf; tomatoes, one-eighth of a medium tomato. Each day a premeasured sample of each vegetable was weighed to the nearest tenth of a gram for converting the vegetables selected and consumed into grams. The children could ask for additional

servings of any vegetable. A teacher sat at each table to record the vegetables selected by the children at the table. The teacher did not eat with the children. The children were neither encouraged nor discouraged to eat; no comments were made concerning the amount or kind of food that was eaten. Outside influences were controlled as much as possible so that objectivity could be maintained.

Records were kept of the number of servings of vegetables selected by the children. The servings were then converted to grams. Plate waste was weighed and subtracted from the grams selected to determine the vegetables consumed by the children. The total and mean grams were calculated for the vegetables selected and consumed by the children. Pearson product moment correlation coefficients were computed to determine the relationship between the mean grams of vegetables selected by the children and the mean grams consumed. A one-way analysis of variance was computed to determine the relationship between raw and cooked vegetables. A one-way analysis of variance was again used to determine if order of presentation was related to the children's selection and consumption of vegetables.

Results of the study indicated a high correlation between the mean grams of vegetables selected by the children and the mean grams consumed; raw vegetables were preferred over cooked vegetables; and order of presentation was not significantly related to the mean grams of vegetables selected nor consumed by the children.

RELATIONSHIP OF THE ORDER OF PRESENTATION OF VEGETABLES TO AMOUNT SELECTED AND CONSUMED BY NURSERY SCHOOL CHILDREN

by

Nora Jane King

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APPROVAL SHEET

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CHAPTER I

THE PROBLEM

Parents of preschool children and nursery school teachers report that of the four major food groups--meats and meat substitutes; vegetables and fruits; breads and cereals; milk and milk products--vegetables are least accepted by nursery school children. From the review of literature and research, there appears to be evidence by Imlay (1925); Roberts (1927); Prentiss and Jones (1930); Dunshee (1931); Temple (1932); Lamb and Ling (1946); Baker (1949); Southmayd and Marioka (1954); Miron, Torrance, and Roughton (1956); Van Duyne (1963); and Fesmire (1965) to support the reports from the parents and teachers. Investigators who have attempted to determine whether or not methods of preparation of vegetables might make them more acceptable to children include Lowenberg (1929); Neely (1931); Southmayd and Marioka (1954); Ilg and Ames (1955); Dudley, Moore, and Sunderlin (1960); and Van Duyne (1963).

Vegetables are excellent sources of some essential nutrients; namely, green leafy and yellow vegetables are excellent sources of vitamin A while bright green garden leaf lettuce, romaine, and dark green salad greens furnish vitamins A and C. Some vegetables, such as the dark green leafy ones provide iron. If for no other reason, vegetables should be included in the diet for the variety in flavor, color, shape, and texture which they afford.

A comprehensive study of foods selected and consumed by preschool

children was conducted at the University of North Carolina at Greensboro Nursery School. The study required that food be served cafeteria style; thus, the children had the opportunity to select the foods they thought they wanted to eat. The study provided the opportunity to investigate the order of presentation of vegetables and its relationship to the total amount of vegetables selected and consumed by the twenty-four children.

I. PURPOSE OF THE STUDY

The primary purposes of the study were: (a) to determine which vegetables from a selected group of raw and cooked vegetables twenty-four preschool children selected to eat; (b) to determine the apparent amount of vegetables selected by twenty-four preschool children; (c) to determine the apparent amount of vegetables consumed by twenty-four preschool children; (d) to determine if the order of presentation of the vegetables was related to the amount of vegetables selected by the twenty-four children; and (e) to determine if the order of presentation of the vegetables was related to the amount of vegetables consumed by the twenty-four children.

II. HYPOTHESES

The hypotheses of this study were: (a) the more vegetables the children select, the more they consume; (b) nursery school children select a larger amount of raw than of cooked vegetables; (c) nursery school children consume a larger amount of raw than of cooked vegetables; (d) there is no relationship

between the order of presentation of vegetables and the amount of raw vegetables selected or consumed by the children; (e) there is no relationship between the order of presentation of vegetables and the amount of cooked vegetables selected or consumed by the children.

III. DEFINITIONS OF TERMS USED

For the purpose of clarity, the definitions of terms indicated below will be used throughout the paper.

Vegetables--are succulent portions of garden plants used as foods. The vegetables in this study included raw and cooked preparations of cabbage, carrots, celery, spinach, and tomatoes, plus cooked preparations of green beans and green peas.

Order of presentation--is the position of the group of vegetables in relation to the other major food groups from which the children selected their food.

Subjects--were limited to the twenty-four three and four year old children already in attendance at the University of North Carolina at Greensboro Nursery School. Admission to the nursery school was granted according to the order in which parents' applications were received by the nursery school director; therefore, a group, not a random sample, was represented by the children.

IV. BASIC ASSUMPTIONS

Prerequisites for the present study included several basic assumptions. In the first place, it had to be assumed that if children were presented with a variety of foods and freedom of choice, they would select those they wanted to eat. Second, it had to be assumed that they would select some vegetables. Third, if a vegetable was chosen by a child, it was assumed that he would eat part of the vegetable. Fourth, it was assumed that the amount of vegetable

consumed was equal to the difference between the amount selected and the amount of plate waste.

V. DATA SECURED

Records were kept for the amount of each vegetable selected and the amount of each vegetable consumed by each child for twenty consecutive school days. From those records, the total grams selected and consumed of each vegetable group and the mean grams selected and consumed of each vegetable group were determined for each day.

VI. ORGANIZATION OF REMAINDER OF THESIS

The remainder of the thesis includes four chapters. The second chapter contains a review of the literature related to food preferences and food consumption of preschool children as well as a review of studies in which the researchers were chiefly concerned with vegetables consumed by preschool children. Chapter three includes the procedures used in the present study and describes the location of the study, the selection of subjects, cooperative aspects of the study, the pretest, the procedure, the data collection, and the data analysis. The data collected and a discussion of the findings of the study are presented in chapter four. A summary of the research, conclusions, limitations, and recommendations for further study are discussed in chapter five.

CHAPTER II

REVIEW OF THE LITERATURE

A review of literature revealed numerous writings related to the feeding of children. It has been shown by Davis (1954); Stephenson (1934); Prevey (1936); and Justice, Mattson, and Schunk (1946) that when presented with a number of nutritious foods, children can select an adequate diet for themselves. Foods consumed by preschool children have been analyzed as to the amount of food consumed and the nutritive value of the food consumed. According to the reports of Dunshee (1931); Lamb and Ling (1946); Mirone, Torrance, and Roughton (1956); Imlay (1925); Roberts (1927); Prentiss and Jones (1930); Temple (1932); Baker (1949); Southmayd and Marioka (1954); Van Duyne (1963); and Fesmire (1965), vegetables tend to be the food group that is most commonly disliked by preschool children in the United States. As a result of the widespread dislike of vegetables, studies have been made by (a) Vance (1932); Vance and Temple (1933); Lamb and Ling (1946); Mirone, Torrance, and Roughton (1956); Temple (1932); Stiles (1933); and Fesmire (1965) to determine which vegetables were most accepted or rejected by children and by (b) Dudley, Moore, and Sunderlin (1960); Lowenberg (1929); Neely (1931); Southmayd and Marioka (1954); Ilg and Ames (1955); and Van Duyne (1963) to determine whether or not methods of preparation could be related to the dislike of certain vegetables.

I. FOOD SELECTION STUDIES

From 1914 through 1920, Davis (1954) conducted a study of the self-selection of diets by young children. The list of foods comprised a wide range of foods of both animal and vegetable origin that would adequately provide all the food elements, amino-acids, fats, carbohydrates, vitamins and minerals known to be essential for human nutrition. The food list was confined to natural, unprocessed foods without made dishes of any sort; i.e., cereals were whole grains; milk products such as cream, butter or cheese were not used. The foods were prepared as simply as possible and excluded combinations of food materials such as custards, soups or bread.

Davis concluded that the children were quite capable of selecting a diet adequate in nutritional requirements. She reported that

> Patterns of selective appetite, then, were shown to develop on the basis of sensory experience; i.e., taste, smell, and doubtless the feeling of comfort and well-being that followed eating, which was evidenced much in the breast-fed infant. In short, they were developed by sampling, which is essentially a trial and error method. (p. 73)

In a report to the Chicago Pediatric Society in 1932, Davis (1933) presented results of a year's experiment in self-selection of diet by children in the Orthopedic Ward of the Children's Memorial Hospital in Chicago. The advantages of Davis's self-selection method of feeding were summarized by Fesmire (1965) as follows:

1. A greater variety in diet could be afforded without increase in cost.
2. The method allowed for individual choice in food.

3. The children displayed better appetites and more enjoyment of food.

4. The total mealtime was shortened by fifteen to thirty minutes and lessened nursing time and labor spent in serving meals.

5. The amount of food waste was consistently less for the orthopedic ward than for any other ward in the hospital.

6. The most noticeable results from the standpoint of dietetics was the lowering of the proportion of sweet and starchy foods and the corresponding increase in the fruits, vegetables and meats. (p. 14)

Vance (1932) conducted an investigation at the Nursery School of the Iowa State College to determine the extent to which there might be a preference for some foods. Forty-four different children were included in his records with an average of twenty-five observations each. Records were kept of the order in which the children tasted the foods on their plates as well as the order in which they finished them. Arrangement of the foods in the order of the average rank for finishing revealed that meats, apples, sandwiches, and eggs were finished early and vegetables were eaten last. Vance found a preference for raw vegetables over vegetables that were creamed.

Vance and Temple (1933) directed a study that compared the food preferences of nursery school children with those of rural children. They found that children tended to finish foods on their plate in the order in which they tasted them; the order of preference as determined by average rank was soup, fruits, cereals, raw vegetables, eggs, meats, tomatoes, potatoes, milk, butter, vegetables, and toast; there was a greater percentage of negative reaction to the foods less commonly served.

It was Stephenson's (1934) purpose to discover whether or not children

ate more readily when allowed to choose for themselves rather than being served according to the conventional method. A further purpose was to determine the amount and kind of food that the children would choose to eat. She used six children for sixteen different meals which made a total of 96 cases. Sixteen small dishes containing a measured serving of meat, fish, eggs, apples, bananas, oranges, tomatoes, bread, butter, milk, and six vegetables were presented to each child. When a serving was finished, it was replenished with a pre-measured serving of the same food without comment from the adult. The child was allowed to eat as much or as little of any food that he wished. Records were kept of the order of selection of the foods and the amount each child ate. The food eaten in the main dining room under normal conditions was recorded in order to compare it with the amount eaten during the experiment. Foods were ranked according to the number of times chosen and the amount eaten. Stephenson reported the following conclusions:

1. Considering the number of times chosen and the amount eaten, bananas, apples, milk, raw carrots, bread, and butter are the most preferred foods; and lettuce, turnips, raw cabbage, cauliflower, and cooked cabbage are the least preferred.

2. Raw carrots, bananas, apples and bread were chosen first, each meal the greatest number of times, and cooked carrots, turnips, cooked cabbage, and lettuce were chosen last in the meal.

3. The mean amount of the time spent in eating was 33.3 minutes, but the time spent in eating gradually decreased as the experiment progressed.

4. The children ate as much if not more food when eating by the experimental method as they did when eating by the conventional method.

5. Fifty-three percent of the total food eaten by the experimental method

was fruit, 25 percent was milk, 9 percent was protein food, 7 percent was vegetable, 2 percent was cereal, and 1 percent was fat.

6. The children enjoyed the freedom of eating by the experimental method as is shown by the manner they assumed of attending strictly to the business of eating until they had eaten all they cared for. (p. 51)

Prevey (1936) studied the children enrolled at the nursery school of the Institute of Child Welfare at the University of Minnesota to find out whether or not a child would select for himself as adequate a diet as would be selected and served to him by a nursery school teacher. She observed a small group of children who served themselves from a limited number of foods. Prevey concluded that children would probably secure an adequate diet over a period of time if adequate foodstuffs were offered. She also stated that food problems would likely decrease under such a regime because of lessened adult pressure.

At the Purdue Nursery School, Justice, Mattson, and Schunk (1946) studied and compared the food intake of a group of 26 children at lunch. Two styles of service were used: "standard" and "self-service". The intake of individual foods and groups of foods appearing in different menus were determined. Calorie and protein values were calculated. The investigators found that the percentage of children consuming more food under self-service was higher for all food groups except milk. Calorie and protein intakes averaged higher with self-service for three out of four menus on which data were collected for 433 individual lunches.

Dudley, Moore, and Sunderlin (1960) wanted to know how methods of preparing vegetables affected the choices and consumption of vegetables by

preschool children. The children in their study were offered four different vegetables, each prepared in four different ways during each experimental period. Rutabagas and carrots were selected to represent the yellow vegetables; green beans and asparagus represented green vegetables. Preparations of green vegetables consisted of "au gratin", creamed, buttered whole, and buttered pieces while the yellow vegetables were served as buttered julienne, buttered grated, raw, and creamed. Records were kept of the choices made and the number of grams eaten by each child. According to observations made in that study, raw preparations of carrots and rutabagas were preferred to any other preparation. The raw preparation was chosen more often, eaten in larger amounts, and left uneaten in smaller proportions than was true of any other preparation of those vegetables. Of the green vegetables served, "au gratin" preparations were preferred to a greater extent than were creamed vegetables. Great variations between individuals in the choices made and in the consistency of their choice suggests that one should be cautious in making generalizations to the effect that all children dislike food prepared in certain ways.

The purpose of a study by Mayorga (1963) was to determine the effect of choice of vegetable on the amount eaten by preschool children at the noon meal in a nursery school. She observed 27 nursery school children whose ages ranged from two to four years. As a part of their noon meal, the children were served one of four cooked vegetables: diced carrots, chopped broccoli, green peas, and cauliflower. The other foods remained constant for each day of the

week. The children were paired and placed in either an experimental or a control group according to their age and the amount of vegetables eaten during a trial period. During a training period, the two groups ate separately but were served the same menu with one exception: the experimental subjects had the choice of an additional vegetable. Although the experimental subjects showed a trend in increased consumption over the control group, the results were not statistically significant; however, upon comparing the eating performance of the experimental subjects to their performance during the training period, the results were significant beyond the .05 level. She found no significant difference when she made the same comparison with the control group. Mayorga concluded that choice was the factor in increasing the amounts consumed by the experimental subjects. She suggested that a choice of cooked vegetables offered to preschool children at meals might well be used as a means of improving their eating performance with respect to cooked vegetables.

II. FOOD CONSUMPTION STUDIES

At the Institute of Child Welfare at the University of Minnesota, Dunshee (1931) studied factors affecting the amount and kind of food eaten by nursery school children. Over a period of seven months and ten days, 3005 records were made of 37 children by 46 students. Some findings from that study are listed below.

> The children who stay at the table the longest time on the average tend to eat less food. Even when age is held constant this relationship is maintained, although to a somewhat less degree.

> The attitude of "disliked but ate" was assumed most often toward vegetables and least often toward milk, the other foods ranging in between. This result gives some support to the opinion that children like vegetables the least of any food. (p. 181)

Morse and Chittenden (1943) in a study conducted at the Iowa State College Nursery School attempted to determine the effect of size of initial food servings on the eating efficiency scores obtained during the nursery school mealtime. The sixteen subjects were exposed to two mealtime procedures which were used alternately for four weeks. The first method consisted of serving initially three tablespoonfuls or comparable sized portions of all foods on the menu while the second method involved serving initially one tablespoonful or comparable sized portions of all foods on the menu. Additional servings were given in both methods as the child desired. With each method of serving, the weekly menus were repeated. Although the difference between the two methods was not statistically significant, there was a trend toward the following results:

> Higher efficiency scores were obtained when one tablespoonful of each food was served initially.
>
> The children ate more food and in a shorter length of time when they were served a small amount of food initially.
>
> The time between seating and attack on food was slightly longer when small amounts of food were served initially.
>
> A very slight positive correlation was found between number of food units eaten and length of eating time. (p. 279)

Lamb and Ling (1946) investigated the food consumption and preferences of eight children from the Nursery School of Texas Technological College for one year during which food consumption and food preference records were taken

simultaneously for one week at three-month intervals. The subjects ranged in age from two years, two months to three years, seven months. Some of the conclusions presented by Lamb and Ling were:

> By comparing the food consumption records gathered in this study with established standards it has been found that although the nutrient intake of a child may be generally adequate, his consumption of certain food groups can still fall short of the recommended amounts.
>
> The preschool child has learned to like a wide variety of foods by the time he reaches the nursery school age and to regard eating as a pleasurable occupation.
>
> Preschool children of this locality have a tendency to like green and yellow vegetables least of all major food divisions, and to increase this lack of interest with age.
>
> Frequently inadequacy in the amounts and kinds of food consumed can be traced to faulty meal planning on the part of the responsible adult rather than to lack of positive liking of the child for these foods. (p. 217)

Mirone, Torrance, and Roughton (1956) at the University of Georgia Nursery School investigated the quantity of foods consumed at the noon meal by twenty-one three years, ten and one-half months old preschool children. They found that with the exception of Irish and sweet potatoes, vegetables were consumed in the least amounts and desserts in the largest amounts.

III. VEGETABLE STUDIES

For a period of twenty weeks, Imlay (1925) studied a group of nursery school children. The children in her group seemed to have a general aversion to vegetables. Spinach, one of the two vegetables served to all children, was most disliked. At first, one-fourth cup and often just a taste was all most

children would eat; but by the end of the study, the majority were eating one-half cup or more of most vegetables. The change is said to have been brought about by having dishes holding one-fourth, one-third, and one-half cups, and serving the vegetables at the table. The children began asking for larger measures very soon after the new method of serving was started.

Roberts (1927) cites too few vegetables as one of the causes of malnutrition. She relates that the scanty use of vegetables is common among poorly nourished children. Although vegetables are not indispensable in the diet of childhood, as milk practically is, it is much easier to plan a diet adequate in iron and other minerals and vitamins if vegetables are included. The child's dislike for vegetables is by far the most universal reason for their disuse; this dislike is, in turn, due largely to failure on the parents' part to begin early to teach the children to like vegetables and to become accustomed to the pronounced flavors.

During a period which covered fifty meals, Lowenberg (1929) fed twelve relatively unfamiliar vegetables to thirty-three children with an average of nine children being served at a meal. Responses of the child in verbal remarks, facial expressions and order of his tasting foods as well as the order in which children finished were recorded. The child's reaction to varying texture in the vegetable was especially studied. The vegetable was prepared by boiling until tender and seasoning with butter and a little salt. Most vegetables were served in raw sticks, chopped raw, and in puree form which permitted three distinct variations in texture: crisp and firm, soft and firm (cooked), and soft and

mushy (cooked). The vegetables were fed to the children in Group I for six weeks, after which the vegetables which had been most favorably received were fed to Group II for six weeks. The texture of the latter vegetables was varied as indicated before. During the third six weeks period, Group I again ate lunch at the nursery school and were served the same vegetables as had been served during the second period. The servings of a new food were necessarily small because the children were required to eat all the foods on the plate; therefore, the reactions probably were not as marked as if it had been possible to allow the child to leave the disliked food or eat it as he chose.

A summary of Lowenberg's results indicate that there were twice as many remarks which indicated merely interest as there were remarks which were classified as favorable and unfavorable. Little proof was offered from verbal remarks that there was a factor common to the vegetables which caused the children to prefer any vegetables more than others. Furthermore, little preference was shown for any one of the texture variations. Facial expressions in response to the vegetables showed a better check in that this was an objective method and showed less ambiguous results. Interesting shape and appearance characterized the three vegetables preferred by both groups: broccoli flowers, stalk endive and brussels sprouts. Whole raw vegetables were preferred first by both groups followed by whole cooked. Least preferred of all variations of vegetables were the pureed. Interesting form and crisp, firm texture elicited more pleased facial expressions from the children. Kohlrabi, broccoli flowers, and dandelion greens seemed to be the most popular.

According to Lowenberg, the children in the study did not object to vegetables in their meals and did not show noticeable dislike for them; however, they showed great interest in the new vegetables. The vegetables the children ate first and commented upon most favorably were those in which they seemed most interested. Lowenberg suggested that possibly insufficient thought has been given to attractive and interesting service of vegetables to children which may be the cause of the child's dislike for them rather than that vegetables possess a factor inherent in themselves which evoke such dislike. Since it was difficult to eliminate other variables and to vary texture only, this study indicated that variations in general appearance which were simultaneous with variations in texture affected the child perhaps more than the texture variations.

In observing food habits in young children, Prentiss and Jones (1930) gave attention to the type of food that was most frequently refused, returned, or chosen a second time. As they expected, they found that vegetables were less well liked than other types of foods.

Neely (1931) studied the reactions of a group of Mexican school children to relatively unfamiliar vegetables and recorded the reactions of the children under the headings of facial, postural and verbal. She also kept a record of the time before tasting, the time to eat, the percent who tasted but did not finish, and the percent of children who did not appear to be feeling physically normal at meal time. She found that, in general, the reactions of these children to relatively unfamiliar vegetables were favorable. She reported that only 3.21 percent of the children failed to taste the vegetables, and only 13.4 percent failed

to finish eating them. The data revealed a relationship between the facial, postural, and verbal reactions of the children to the vegetables with the percent failing to finish the food. In each case the most differentiating factor seemed to be the percent not finishing. In 70 percent of the cases, there was an improvement in the score for the second serving of vegetables; this improvement was 10 percent higher with the raw than with the cooked vegetables. In general, the scores for the cooked vegetables of firm texture were higher than those for the softer boiled ones and the pureed ones. Neely reported that generally when the total number of raw and boiled vegetables were considered, the scores for the reactions and the percent of children failing to finish the food, as well as the ranking from all of the factors recorded, indicated a preference for the raw vegetables. The boiled vegetables had a slightly higher rank when the average rankings of the four vegetables served both raw and boiled were compared; however, for the second serving, the raw had a higher score, but the boiled ranked higher on the percent not finishing. When the vegetables were ranked on the bases of score and percent not finishing, spinach ranked highest and turnip greens ranked lowest.

Temple (1932) studied forty children ranging in age from twenty to sixty months. She found that according to the finishing ranks of all foods served, cream of pea soup, fruits, cereals, and raw vegetables were the most preferred foods while milk, buttered vegetables, and toast were the least preferred. Raw vegetables were the preferred foods in the dinners. Of the raw vegetables served, she found sliced tomatoes as the most preferred and cabbage salad as

the least preferred. The preferred food in the suppers was cream of pea soup.

At Iowa State College, Stiles (1933) conducted an investigation the purpose of which was two-fold: (a) to determine by the method of paired comparisons the order of preference of eleven buttered vegetables; and (b) to discover possible reasons for the children's favorable or unfavorable reactions toward these vegetables. The twenty preschool children were subjected to fifty-five tests because the method of paired comparisons required that every vegetable be compared with all the other vegetables. Every child was given a taste of two vegetables during each testing period. He was then asked to state his preference. Records were made of the child's preference, the vegetables which he tasted a second time, and any remarks which he made concerning the food. The vegetables which the child liked, disliked, or refused, and those which were never offered him were indicated on a prepared form by the parents before the child entered nursery school. The principal findings of the study are listed below:

1. During this investigation none of the children refused to taste a vegetable.

2. The order of preference of the vegetables as determined by the total number of first choices is: (1) green beans, (2) potatoes, (3) carrots, (4) cabbage, (4) cauliflower, (5) peas, (5) spinach, (6) turnips, (7) beets, (8) green lima beans, (9) celery.

3. No two children ranked the eleven vegetables in the same way.

4. The older children showed a greater preference for spinach and peas than did the younger children.

5. Approximately half of the vegetable dislikes or refusals, which were present when the children entered nursery school, were overcome after

the children had been in attendance for a period of time.

6. Second helpings were taken in one hundred and sixty-seven cases; in every instance it was the preferred vegetable which was chosen.

7. In general, those vegetables which were favorably commented upon by the children were ranked relatively high; while those which were unfavorably commented upon were ranked relatively low.

8. The favorable comments were three times as numerous as the unfavorable ones. (pp. 41-42)

Baker (1949) studied three types of (elementary, junior and senior high) schools to determine children's preferences among certain school lunch dishes, the factors affecting their acceptance of foods served, and the selection of balanced meals. Her findings were: the location of the test dishes on the counter did not appear to affect the acceptance of foods since the majority of students looked at everything before making their selection; main dishes containing cheese and vegetables received much lower acceptance than main dishes including meat, fish, and eggs.

Southmayd and Marioka (1954) served twelve cooked vegetables and twelve raw fruits and vegetables as finger foods to fourteen three year olds and fifteen four year olds attending the University of California at Los Angeles Nursery School. Their data revealed that cooked parsnips, rutabagas, and turnips were highly rejected. Southmayd and Marioka (p. 450) stated that "all food service people have found poor acceptance of these vegetables among urban American populations of any age level." The data also indicated rejections of 82 percent for cooked tomatoes, 69 percent for spinach, and 59 percent for green beans. The only cooked vegetables accepted by more than 50 percent of the

children were peas and carrots. Of the fifteen three year olds, ten refused more than 50 percent of the cooked vegetables offered while only four refused more than 50 percent of the raw vegetables and fruits used as finger food. Altogether, there was a 71 percent rejection of cooked vegetables, but only 35 percent for the raw finger foods.

According to Ilg and Ames (1955), children's appetites tend to be low from two to three years of age, but definite preferences for food are coming to the surface. For their color and sweetness, carrots and beets may be the preferred vegetables. By age three, green vegetables may be accepted for the first time, and raw vegetables are preferred over cooked ones.

In attempting to appraise the relationship between the food preferences of the father and those of his preschool child, Bryan and Lowenberg (1958) found that the only correlation value of significance was for the vegetable group ($4=.28$; $P=.05$). They concluded that there does seem to be a relationship between the child's and his father's preference for vegetables. The data also revealed that vegetables were among the foods least liked by both groups.

Van Duyne (1963) attempted to find out whether or not varying methods of preparing a frequently refused food would increase children's acceptance of that food. She had the parents of the forty-three children enrolled in the lunch program fill out food history forms from which she compiled data in terms of the number of children liking, accepting, refusing, or never being served a food. Of the foods checked most often as being refused or never served, sixteen were chosen for the study: asparagus, beets, broccoli, brussels sprouts,

cabbage, cauliflower, lima beans, peas, spinach, squash, sweet potatoes, raw tomatoes, cooked tomatoes, cottage cheese, frozen halibut, and liver. Each food included in the experiment was prepared by three different methods and included in one of sixteen menus. In most of the menus, meat, eggs, or other high-protein food were found. A starchy vegetable or breadstuff, a cooked vegetable, a raw vegetable or fruit, a dessert, and milk were also included. Two methods were used for measuring the acceptability of the test foods: (a) by recording how many children liked, accepted, or refused a food; and (b) by noting the order in which the children finished foods served at each meal. Meats, fruits, dairy products, breads and cereals were liked and accepted by the children more than vegetables. Eighty-two percent of the children liked corn on the cob; 59 percent liked whole kernel corn; while 61 percent were reported to like raw carrots. Although white potatoes were generally popular, they were preferred as chips by 86 percent and as French fries by 79 percent of the children. Most vegetables were less well liked. Boiling and buttering was the best-liked method for nine of the twelve cooked vegetables. Van Duyne (p. 84) stated that "Results confirmed previous reports that nursery school children prefer simply prepared foods."

Fesmire (1965) investigated the foods selected and consumed by a group of twenty-four nursery school children who were served cafeteria style at the noon meal for a period of twenty days. Of the four food groups served to the children--meat and meat substitutes; vegetables; finger foods; and desserts--Fesmire (p. 47) reported that "vegetables and finger foods were least preferred

by the children who neither selected nor consumed any great quantity of either of these food groups." In discussing the results, the author reported that the most frequently selected vegetable was green peas, but that less than half the amount of peas selected was consumed. Although broccoli was the least frequently selected vegetable, percentages revealed that 69 percent of the broccoli selected was eaten by the children.

There has been much discussion and writing on the subject of feeding preschool children. Studies have been made to determine which foods preschool children will select to eat if given a free choice. Other studies have explored various aspects of the foods consumed by preschool children. Although a few investigators revealed findings to the contrary, the consensus is that, as a rule, children do not enjoy vegetables. Exploration of the preschool child's dislike of vegetables has been limited to (a) which vegetables were most accepted or rejected by the child; and (b) whether or not methods of preparation could be related to the dislike of certain vegetables. In reviewing the literature, no studies were found which proposed to determine if the order of presentation of vegetables had any effect on the foods selected and consumed by preschool children.

CHAPTER III

STUDY DESIGN

This study was undertaken to determine whether or not the order of presentation of vegetables had any relationship to the amount of vegetables selected and consumed by twenty-four children enrolled at the University of North Carolina at Greensboro Nursery School during the 1966-67 school year.

I. LOCATION OF STUDY

The study was conducted at the nursery school which is a part of the School of Home Economics and located on the University of North Carolina at Greensboro campus. The nursery school serves as a laboratory for courses in home economics, child development, psychology, and other departments of the university. The nursery school building contains two large play rooms, a lobby, a kitchen, an office, and bathrooms. Before lunch, one of the play rooms was set up for a rest period while the other was arranged as a dining area. Each child had an assigned place for eating lunch at one of the five tables.

II. SELECTION OF SUBJECTS

The twenty-four children enrolled in the regular session at the University of North Carolina at Greensboro Nursery School served as subjects for the present investigation. The twelve boys and twelve girls ranged in age from 3 to

5 years. The nursery school enrollment was comprised of children from the upper middle and upper socioeconomic groups. Professions represented by the fathers included three attorneys, four salesmen, an electrical engineer, a civil engineer, a self-employed accountant, a self-employed construction engineer, a public relations counselor, a high school teacher, an office manager and cost controller of a textile finishing plant, a pharmacist, a builder, a minister of music, a chemical engineer, a doctor of vetenary medicine, a college professor, an owner of a chemical corporation, a distributor of hosiery products, a co-owner of a lumber company, and one insuror and realtor. Of the few mothers who were employed full time, two were college professors; one was a full-time graduate student; and one was the director of a regional Head Start training program. The three mothers employed part-time held positions as a field-merchandizer, a secretary, and a substitute teacher.

III. COOPERATIVE ASPECTS OF THE STUDY

The nursery school director explained to the parents prior to the opening of school that the primary functions of the nursery school were to train college students and to provide a laboratory for research. At the time of the child's acceptance for admission to the school, the parents were informed that cooperation was expected from them in the total nursery school program. Thus, it was not unusual that there was one hundred percent parent cooperation throughout the study. Specifically in regard to the present study, the parents were sent a letter asking them to refrain from discussing the nursery school

noon meal with their children (Appendix A).

IV. PRETEST

Before beginning the study, a pretest was conducted for two days. This provided an opportunity to make any necessary adjustments in the study plans. It also helped to determine the best procedure for serving the food to the children and for recording their selections and plate waste. After the pretest, those persons assisting with the study met to discuss their questions and suggestions.

The pretest gave the children an opportunity to adjust to the new routine. Prior to the pretest, the child's food had been placed on his plate, and the plate was set on the table before the children entered the dining room. A teacher or graduate student sat at each table and ate with the children. During the twenty day experimental period, however, the teacher or graduate student sat at the table with the children but did not eat with them. The children adapted readily to the changes in routine and entered eagerly into the cafeteria style of eating.

V. PROCEDURE

For twenty consecutive school days the noon meal at the nursery school was served cafeteria style in the dining room. The children sat at five tables with the same teacher or graduate student at each table with the same children every day. Two additional tables were set up, the food arranged on them, and the food served from them.

At 11:55 each day, the children began to enter the dining room in random order. The standard procedure for randomizing the children was the same every day: twenty-four cards were removed from a deck of bridge cards and a child's name was written on each card. The twenty-four cards were shuffled and cut five times and then turned over one at a time. As the child's name appeared, he was given a number in order of 1 - 24. Every day each child was given a card with a number on it before entering the dining room. The number signified the order in which he was to enter the dining room. At the end of rest period prior to lunch on the first day of the study, the children were told to take their rest pads to their lockers and return to the room in which they had rested. The children were told that for twenty days they were going to be served like they would be served in a cafeteria and that the card given to them would be their lunch tickets. As each child's name was called from the randomized list, a card containing the random number was given to him. The children entered the dining room in groups of five and were instructed that they must proceed in the cafeteria line according to the number given them. A graduate student assisted the children in following this procedure. The investigator was in the dining room beside the serving table, and the children gave her their numbered cards thus providing a second check to be sure the children were served in random order.

The same adults, trained and supervised by the investigator, served the food to the children each day. Objectivity and consistency were stressed as concerns of the servers. They were instructed to refrain from asking the

children what they wanted to eat nor could they suggest any particular food to the children. They were to serve only the foods selected by the children. Those who served the food were also instructed not to give a child additional servings of any food already on his plate.

The foods were placed in random order on the serving tables in groups of meat and meat substitutes, raw vegetables, cooked vegetables, and desserts. The procedure for randomization was as follows. Four cards were selected from a deck of cards. The name of each of the food groups was written on a separate card. The cards were shuffled and cut five times and turned over one at a time. As the name of each of the food groups turned up it was placed in its order of presentation--1, 2, 3, or 4. This procedure was repeated for each day of the study.

Vegetables within the two vegetable groups were randomized according to the same procedure as the children and the food groups except that the vegetables within the two vegetable groups were randomized only once and kept that order of presentation throughout the study. Since it was necessary to have two rows of vegetables, the front and back positions were reversed every five days so that each vegetable was on the front row for a total of ten days and on the back row for a total of ten days.

One-half cup of milk was at each child's place when he entered the dining room each day. Extra milk was served upon the request of the child. No comment was made to the child about whether or not he should drink his milk.

The list of foods was made from menus used earlier in the year and no new foods were introduced during the study. The vegetables used were raw and cooked preparations of cabbage, carrots, celery, spinach, and tomatoes, plus cooked preparations of green peas and green beans. Combinations of food materials such as vegetable soup and meat loaf were not used. The vegetables were simply prepared by cooking in a minimum amount of water with small amounts of salt and margarine added for seasoning. Cooked vegetables were cut into small pieces; raw vegetables were cut into small strips, wedges, or leaves. The full-time cook with the assistance of a college student prepared the food following the directions of the thesis director.

The children selected their lunch from the foods presented. They indicated their selection of food to the adults who were serving. The children selected and ate according to their moods and desires and were free to return for as many additional servings as they wanted.

The teacher or graduate student did not eat with the children but recorded the foods selected by those eating at her table (Appendix B). Every attempt was made to keep the children from being influenced by the adults seated at the tables with them. The teachers were not permitted to use the words "food" and "eat". By actions nor words, the teachers neither encouraged nor discouraged the children to eat. They did not comment about a child's food selections nor his consumption. The only guidance given to the children was in the form of specific directions, such as: "This is not play time;" "You may ask for more of anything you want;" or "Finish that spinach before you ask for more

spinach."

The children ate at their regular places which were marked with plastic-covered name cards placed in front of the silverware. When the child had finished eating and before leaving the table, he placed his name card in his plate and left the glass and plate on the table. Prior to the study, the children had carried their plates to a counter near the kitchen before leaving the dining room. By following the procedure of leaving their plates on the table, confusion was kept at a minimu, and plate waste for each child was more readily identified.

The children were required to remain in the dining room for ten minutes so that children who came in last would not be tempted to go into the playroom before they had finished eating. At 12:35, the slow eaters were reminded that their rides were waiting for them.

VI. DATA COLLECTION

Cooked vegetables were measured and served in portions of one standard level tablespoonful to provide a standard measure for expediting the serving procedures. Three two-inch strips of raw carrots and the same portion of raw celery constituted a serving. Raw cabbage and raw spinach were served in amounts of one small leaf each. Medium sized tomatoes were cut into eight wedges; one-eighth of a whole tomato equaled one serving. Each day a premeasured sample of each vegetable was weighed on an Ohaus scale to the nearest tenth of a gram and the gram weights recorded. The number of

selections of each vegetable were converted to the number of grams selected of each vegetable and were recorded using the preweighed sample of each vegetable as a basis for conversion. The vegetables consumed by the children were determined in gram weights, weighed to the nearest tenth of a gram on an Ohaus scale.

The method used for determining the child's daily vegetable consumption was to measure and weigh plate waste for each day for each child. The child's plate waste was subtracted from the vegetables served to that child thus giving the apparent consumption of each of the twelve vegetables for each child for each day. The total number of grams of each of the vegetables consumed by the group of children each day was determined by adding the grams consumed of each vegetable by each child. An average was obtained each day for the group of children of the number of vegetables selected and the grams selected and consumed. (See Appendix C, Tables 8 - 14.)

VII. DATA ANALYSIS

In order to summarize the data, the vegetables were classified into four groups: raw vegetables, cooked vegetables (5), cooked vegetables (7), beans and peas. The total grams selected and consumed of each vegetable group and the mean grams selected and consumed of each vegetable group were calculated for each day (Appendix C, Tables 8 - 14). The total grams selected and the mean grams selected were recorded for the raw vegetables and the same five vegetables cooked. The total grams consumed and the mean grams

consumed were recorded for the raw vegetable group and the same five vegetables cooked. The total grams selected and the mean grams selected were determined for each position which the vegetables could assume. The total grams consumed and the mean grams consumed were determined for each of the positions the vegetables assumed. (See Appendix C, Tables 15-20).

Pearson Product moment correlation was computed to determine the relationship between the mean grams of vegetables selected by the children and the mean grams consumed. A one-way analysis of variance was used to determine the relationship between the mean grams selected of raw vegetables and the mean grams selected of the same five vegetables cooked. A one-way analysis of variance was also used to determine the relationship between the mean grams consumed of raw vegetables and the mean grams consumed for the same five vegetables which had been cooked. A one-way analysis of variance was again used to determine whether or not order of presentation of vegetables was related to the amount selected or consumed.

CHAPTER IV

RESULTS

The primary purposes of the present study were to determine (a) which vegetables from a selected group of raw and cooked vegetables twenty-four pre-school children selected to eat; (b) the apparent amount of vegetables selected and consumed by the children; (c) what relationship existed between the order of presentation of the vegetables and the amount of vegetables selected by the children; and (d) what relationship existed between the order of presentation and the amount of vegetables consumed by the children.

In addition to the raw and cooked preparations of cabbage, carrots, celery, spinach, and tomatoes, green beans and green peas were prepared and the children were given the opportunity to choose these. Because the green beans and green peas were selected in much greater quantity than the other five cooked vegetables, an indication will be made as to whether the five or the seven cooked vegetables are being discussed.

Tables 1 and 2 present a summary of the total number of selections of each vegetable. Raw carrots were selected the greatest number of times, or 250 times; followed by green beans, 189 times; green peas, 148 times; and raw celery, 143 times. Raw spinach and cooked celery were both chosen 9 times each and were the least frequently selected vegetables followed by raw cabbage and cooked spinach with 17 selections each and cooked tomatoes with 12

Table 1

Frequency of Vegetables Selected by Twenty-Four Nursery School Children at the Noon Meal During a Period of Twenty Days as Shown by the Total Number of Selections of Each Vegetable

Vegetable	Number of Selections Raw	Number of Selections Cooked*
Cabbage	17	10
Carrots	250	23
Celery	143	9
Spinach	9	17
Tomatoes	50	12
TOTAL	469	71

*The total frequency of cooked vegetables selected was 408.
The total frequency of all vegetables selected was 877.

Table 2

Frequency of Green Beans and Green Peas Selected by Twenty-Four Nursery School Children at the Noon Meal During a Period of Twenty Days as Shown by the Total Number of Selections of Each Vegetable

Vegetable	Number of Selections Cooked*
Green Beans	189
Green Peas	148
TOTAL	337

*The total frequency of cooked vegetables selected was 408.
The total frequency of all vegetables selected was 877.

selections.

The total grams of vegetables selected and consumed by the children are summarized and presented in Tables 3 and 4. Cooked green beans topped the list of total grams selected with 3014.5 grams. They were also the vegetable with the greatest amount of grams consumed with 2549.1 grams being consumed. The green beans were followed closely by the green peas both in total grams selected which was 2514.8 grams and in the total grams consumed which was 2025.1 grams. Raw spinach was selected and consumed least frequently as shown by the total of 33.1 grams selected and the 17.1 grams consumed. Raw cabbage came closely behind the raw spinach with only 55.0 grams being selected and 46.0 grams being consumed.

In Table 5 the total grams of vegetables selected and consumed from each of the four positions in which the vegetables were presented to the children is shown. It can readily be seen that raw vegetables were more frequently selected and consumed when they were presented in the fourth position. The five cooked vegetables were selected and consumed in greater quantity from the third position while the green beans and green peas were selected and consumed in the largest amount when they were in position two.

Correlation coefficients were computed to determine the relationship between the amount of vegetables selected and consumed by the children. The correlations were consistently high as indicated in Table 6. Therefore, the hypothesis stating that the more vegetables the children select, the more they consume was accepted.

Table 3

Grams of Vegetables Selected and Consumed by Twenty-Four Nursery School Children at the Noon Meal During a Period of Twenty Days

Vegetables	Grams Selected Raw	Grams Consumed Raw	Grams Selected Cooked*	Grams Consumed Cooked*
Cabbage	55.0	46.0	136.3	60.6
Carrots	2353.9	1916.0	372.6	141.5
Celery	1364.9	999.4	140.4	62.3
Spinach	33.1	17.1	375.7	134.5
Tomatoes	935.5	637.7	257.1	77.6
TOTAL	4742.4	3616.2	1282.1	476.5

*The grams selected of cooked vegetables was 6811.4; the grams consumed was 5050.7. The total grams of all vegetables selected was 11553.8; the total of all vegetables consumed was 8666.9 grams.

Table 4

Grams of Green Beans and Green Peas Selected and Consumed by Twenty-Four Nursery School Children at the Noon Meal During a Period of Twenty Days

Vegetable	Grams Selected Cooked*	Grams Consumed Cooked*
Green Beans	3014.5	2549.1
Green Peas	2514.8	2025.1
TOTAL	5529.3	4574.2

*The grams selected of cooked vegetables was 6811.4; the grams consumed was 5050.7. The total grams of all vegetables selected was 11553.8; the total of all vegetables consumed was 8666.9 grams.

Table 5

Grams of Vegetables Selected and Consumed from Each Position by Twenty-Four Nursery School Children at the Noon Meal During a Period of Twenty Days

Vegetables	Positions			
Selected	ONE	TWO	THREE	FOUR
Raw	1170.8	1169.1	1145.7	1256.8
Cooked (5)	328.7	261.1	357.9	334.4
Beans and Peas	761.3	2152.2	1341.1	1274.7
Consumed				
Raw	940.8	859.3	834.3	981.8
Cooked (5)	91.7	96.1	158.1	130.6
Beans and Peas	602.0	1741.3	1100.3	1130.6

Table 6

Relationships Between the Amount of Vegetables Selected and Consumed by the Twenty-Four Children as Shown by Correlation Coefficients

Vegetables Selected	Vegetables Consumed					
	Raw	Cooked (5)	Cooked (7)	Raw and Cooked (12)	Beans	Peas
Raw	.967					
Cooked (5)		.835				
Cooked (7)			.825			
Raw and Cooked (12)				.891		
Beans					.942	
Peas						.829

Analysis of variance was computed to determine whether or not a significant difference existed between the grams selected of raw vegetables and the grams selected of cooked vegetables. It was found that when presented raw and cooked preparations of five vegetables, the children selected significantly more of the raw vegetables than of the cooked vegetables. The mean amount of raw vegetables selected each day was 11.63 grams while a mean of 3.12 grams of the five cooked vegetables was selected each day. The analysis of variance computed between raw and cooked vegetables indicated that the difference between those two means was statistically significant beyond the .01 level of confidence.

Similar results occurred when an analysis of variance was computed to determine whether or not there was a significant difference between the grams consumed of raw vegetables and the grams consumed of the same five vegetables cooked. The mean amount of raw vegetables consumed each day was 8.86 grams while the mean amount of cooked vegetables consumed was only 1.14 grams. The children consumed significantly more of the raw than of the cooked preparations of the vegetables. Analysis of variance indicated that the difference between the two means was statistically significant beyond the .01 level of confidence.

In view of the findings related above, the hypothesis stating that nursery school children select and consume larger amounts of raw than of cooked vegetables was accepted.

Analysis of variance was computed in order to determine whether or not

the order of presentation of vegetables was significantly related to the amount selected and consumed by the children over a period of twenty days. F-scores were calculated for the mean grams selected of the three vegetable groups: raw, cooked (5), and cooked (7); F-scores were also calculated for the mean grams consumed of the same three vegetable groups. A summary of the relationship of position to the amount of vegetables selected and consumed by twenty-four nursery school children is found in Table 7. It must be noted that in order for findings to be significant beyond the .05 level of confidence, F-scores had to be higher than 3.24.

Analysis of variance revealed that the order of presentation of vegetables in relation to the other food groups was not significantly related to the amount of vegetables selected by the children. Also, the order of presentation of vegetables in relation to the other food groups was not significantly related to the amount of vegetables consumed by the children except in the case of raw vegetables consumed.

In the case of raw vegetables consumed, analysis of variance showed that the children consumed significantly more raw vegetables when those vegetables were in the first position. The raw vegetables were in position one on four of the twenty days, and the mean grams consumed on each of the four days was 11.75 grams. The raw vegetables occupied positions two, three, and four on 5, 6, and 5 days respectively. The mean grams consumed per day in positions two, three, and four was 8.85 grams, 6.87 grams, and 8.89 grams respectively. The analysis of variance between the four positions indicated

Table 7

Relationship of Position to Amount of Vegetables Selected and Consumed by Twenty-Four Children at the Noon Meal During a Period of Twenty Days as Shown by F-scores

Vegetables	F-scores
Selected	
Raw	2.49
Cooked (5)	2.35
Cooked (7)	0.22
Consumed	
Raw	3.26
Cooked	1.22
Cooked (7)	0.18

that the difference between those means was statistically significant beyond the .05 level of confidence.

On the basis of the above findings, however, it cannot be asserted that the order of presentation of vegetables was related to the amount of vegetables selected and consumed by the children. In the first place, only one of the tests for determining whether or not position was related to the amount of vegetables selected and consumed revealed a statistically significant difference. Second, even though the analysis of variance indicated that position was related to the amount of raw vegetables consumed, it did not indicate such a relationship for the amount of raw vegetables selected. Factors other than position which chould not be measured might have caused such a result. For instance, the decreased consumption of foods other than vegetables might have resulted in a greater consumption of raw vegetables. Also, the temporary moods and desires of the children could have been responsible for such an increase in raw vegetable consumption. Furthermore, when the analysis of variance was computed to determine if position was significantly related to the amount of raw vegetables consumed, the resulting F-score was 3.264 which is barely more than the 3.24 necessary for findings to be significant beyond the .05 level of confidence. Thus, the third hypothesis which stated that the order of presentation of vegetables in relation to the other food groups is not related to the amount of vegetables selected or consumed by the children had to be accepted.

I. SUMMARY

In summary, it can be stated that the children showed definite preferences for certain vegetables. A high correlation was found to exist between the amount of vegetables selected and the amount of vegetables consumed by the twenty-four nursery school children. They selected raw vegetables more frequently than cooked vegetables. When the same five vegetables were compared in raw and cooked preparations, the total grams selected of raw vegetables was more than three times the total grams selected of cooked vegetables while the total grams consumed of raw vegetables was more than seven times the amount consumed of cooked vegetables. Statistical analysis showed that raw vegetables were selected and consumed in significantly greater amounts than the same cooked vegetables. However, the total grams selected and the total grams consumed of green beans and green peas alone was more than the total grams selected and the total grams consumed of the raw vegetables. The order of presentation of vegetables in relation to the other food groups was not related to the amount of vegetables selected by the children. Although an analysis of variance did indicate that position was related to the quantity of raw vegetables consumed, the finding could not be accepted because of the likelihood of chance factors which could not be measured.

CHAPTER V

CONCLUSION

The present study was undertaken to determine (a) which vegetables from a selected group of raw and cooked vegetables twenty-four nursery school childred selected to eat; (b) the apparent amount of vegetables selected and consumed by the children; and (c) what relationship existed between the order of presentation of the vegetables and the amount of vegetables selected or consumed by the children.

I. SUMMARY

The study was conducted at the University of North Carolina at Greensboro Nursery School which is a child development laboratory for the School of Home Economics. The twenty-four three and four year old children enrolled at the nursery school served as subjects.

For twenty consecutive school days the children entered the dining room in random order, selected what they wanted to eat, and ate it without being encouraged nor discouraged by the adults present. Vegetables used in the study included raw and cooked preparations of cabbage, carrots, celery, spinach, and tomatoes plus cooked preparations of green beans and green peas. After everyone had been through the line, the children could return to the serving tables for as many additional servings as they wanted of any vegetable. A

graduate student or nursery school staff member sat at each of the five tables with the children but did not eat with them. Her primary function during the investigation was to record the foods selected by the children.

Cooked vegetables were measured and served in portions of one standard level tablespoonful. Raw vegetables were served in the following amounts: carrots and celery, 3 two-inch strips; cabbage and spinach, one small leaf; tomato, a small wedge equal to one-eighth of a medium-sized tomato. Each day, a premeasured sample of each food was weighed to the nearest tenth of a gram on an Ohaus scale. The weight of those samples was used as a basis for conversion of the number of selections of each vegetable into the grams selected of each vegetable. The amount of each vegetable consumed was computed by weighing plate waste to the nearest tenth of a gram on the Ohaus scale and subtracting that weight from the total grams of that vegetable selected.

The vegetables were classified into four groups: raw, cooked (5), cooked (7), beans and peas. The mean grams selected and the mean grams consumed per day was calculated for all four groups. Correlation coefficients were computed and revealed a high relationship between the amount of vegetables selected and the amount consumed for all four groups. When raw and cooked preparations of the same five vegetables were compared, analysis of variance showed that the children selected and consumed significantly more of the raw than of the cooked vegetables. The mean grams selected and the mean grams consumed of the raw, cooked (5), and cooked (7) were determined for each position the vegetables assumed. Analysis of variance was computed for

the selection and consumption of each food group. The data did not indicate that position was significantly related to the amount of vegetables selected; however, the amount of raw vegetables consumed from position one proved to be statistically significant.

Findings from this investigation agreed with studies by Dudley, Moore, and Sunderlin (1960); Lowenberg (1929); Neely (1931); Temple (1932); Southmayd and Marioka (1954); and Ilg and Ames (1955) who also reported a preference for raw vegetables.

The order of presentation of vegetables was not found to be related to the amount selected and consumed by the nursery school children. This finding agreed with that observed by Baker (1949) who reported that location of the test dishes on the counter did not appear to affect the acceptance of foods since the majority of students looked at everything before making their selection.

II. LIMITATIONS

There were certain limitations that must be considered in relation to this study. Subjects were limited to the twenty-four three and four year old children already in attendance at the University of North Carolina at Greensboro Nursery School. The children were admitted to the nursery school in the order in which their parents' applications were received by the nursery school director; therefore, a group, not a random sample, was represented by the children. Also, from September 20, 1966, until February 6, 1967, (the period prior to the present study) the twenty-four children had been in a setting that

encouraged eating, or at least tasting, all the foods presented to them. No effort was made to control what the children ate before they came to nursery school each day nor after eating the noon meal at the nursery school. The list of vegetables was confined to seven and did not include all possible vegetables. There was no way to control the health problems of the children nor absences due to illness. The randomization of the order in which the children entered the dining room was the only effort made to control the influence of the children upon each other in relation to the vegetables. There was no way in which to control previous experiences which the children might have had with the vegetables used in the present study.

III. CONCLUSIONS

The evidence presented in this study was based on a limited number of children and a relatively short period of time; however, certain conclusions seem justified.

An examination of the vegetables selected and consumed by the twenty-four children revealed a preference for raw preparations of the same five vegetables, but the children selected and consumed a greater quantity of green beans and green peas than either the group of raw vegetables or the group of five cooked vegetables.

Since the children seemed to prefer raw vegetables to the cooked preparations of the same vegetables, parents and teachers who are concerned with children's vegetable consumption might do well to serve more raw

vegetables and less of the cooked preparations. Raw vegetables do contain the same nutrients as do the cooked preparations. Indeed, the raw vegetables may be more nutritious due to the loss of certain nutrients during cooking. In addition, it should be noted that no techniques were used to encourage the children to eat. It might be worthwhile for parents and teachers to use a variety of effective techniques for getting the children to learn to like a variety of vegetables and to consume them in greater quantity.

The results of the study further indicated a high correlation between the amount of vegetables selected and the amount consumed; that is, the more the children selected, the more they consumed. Such findings might indicate that if children are presented with a variety of vegetables and allowed to choose those which they want to eat, they will be more likely to consume the vegetables selected than if they are given a certain vegetable and told to eat it.

Because analysis of the data revealed only one significant finding in relation to the relationship between the order of presentation of vegetables and the amount selected and consumed by the nursery school children, it can be concluded that children will select and consume about the same amount of vegetables regardless of the position from which they are served in relation to other food groups. The fact that the children consumed significantly more raw vegetables when those vegetables were in position one does not offer conclusive evidence that raw vegetables should be served exclusively in that position in order for them to be consumed by nursery school children. It can be seen (Table 5) that raw vegetables were selected and consumed in greater quantity

from the fourth position; that cooked vegetables were selected and consumed in greater quantity from the third position; and that green beans and green peas were selected and consumed in the largest amount from position two. Therefore, parents and teachers might experiment with the idea of serving raw vegetables after the other food groups have been served; cooked vegetables might be served third; and green beans and green peas might be served from any position except that of the first one.

IV. RECOMMENDATIONS

Due to the widespread belief that children do not relish or accept vegetables, it is recommended that further study be done in the area of vegetable selection and consumption. Such studies should include young children, adolescents, and adults as well as preschool children. Research in the area of vegetable selection and consumption should be extended to include the lower socioeconomic group as well as the middle and upper groups.

The day to day relation of vegetables selected and consumed by preschool children could be investigated to determine when the peaks and plateaus of selection and consumption occurred. Such a study might indicate when the freedom of choice ceased to be a novelty.

Analysis of data for individual children would provide depth to the study. Such analysis might also reveal information about the child's vegetable preferences.

The daily randomization of vegetables within the vegetable groups

could be investigated to determine whether or not position within the groups was related to the selection and consumption of vegetables within that group.

A comparison of the amount of vegetables selected and consumed in relation to the placement of the other food groups might reveal such information as to whether more or less vegetables were selected and consumed when desserts were in position one, two, three, or four; or whether more or less vegetables were consumed when meats were in position one, two, three, or four.

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APPENDIXES

APPENDIX A

THE UNIVERSITY OF NORTH CAROLINA

at

GREENSBORO

School of Home Economics Greensboro, N. C. 27412

February 2, 1967

Dear Mr. and Mrs.

You are doubtless aware of the research being done during the lunch period at the nursery school. As a part of that study I am collecting data for my thesis. My plans are to study the vegetable intake by the children.

I, too, will follow the nursery school policy of informing you of the results of the study. During the month of February and until March 3rd, we are asking you to refrain from discussing the food eaten during the noon meal at the nursery school.

I would like to express my appreciation to you for your cooperation.

Sincerely,

(Miss) Jane King
Graduate Assistant

(Dr.) Helen Canaday
Director of the Nursery School

APPENDIX B

Form Used in Recording Daily Vegetable Selection and Consumption

Name of Child: _____

Date: _____

Presentation order of the Vegetable Groups: Raw_____ Cooked_____
(In the blanks following "raw" and "cooked" write 1, 2, 3, or 4.)

Vegetables	First Serving		Additional Servings		Total Servings		Plate Waste	Quantity Consumed	
RAW	Amt.	Gms.	Amt.	Gms.	Amt.	Gms.	Gms.	Amt.	Gms.
Cabbage									
Carrots									
Celery									
Spinach									
Tomatoes									
TOTAL									
COOKED									
Cabbage									
Carrots									
Celery									
Spinach									
Tomatoes									
TOTAL									
Green beans									
Green peas									
TOTAL									

APPENDIX C

Table 8

Number of Children Present for the Noon Meal

at Nursery School Each Day for a Period of Twenty Days

Day	Number Present
1	20
2	19
3	19
4	19
5	20
6	19
7	20
8	20
9	20
10	22
11	22
12	20
13	19
14	19
15	21
16	20
17	21
18	22
19	23
20	23

Table 9

Grams of Raw Vegetables Selected and Consumed

by Twenty-Four Nursery School Children

During the Noon Meal for a Period of Twenty Days

Day	Selected		Consumed	
	Total	Mean	Total	Mean
1	188.2	9.4	144.2	7.2
2	213.5	11.2	139.4	7.3
3	346.6	18.2	269.2	14.2
4	115.3	6.1	90.1	4.7
5	114.8	5.7	78.9	3.9
6	243.9	12.8	190.8	10.0
7	274.2	13.7	217.2	10.9
8	245.0	12.2	187.6	9.4
9	177.2	8.9	126.5	6.3
10	279.9	12.7	211.8	9.6
11	230.0	10.5	164.9	7.5
12	308.1	15.4	252.8	12.6
13	181.1	9.5	149.0	7.8
14	209.8	11.0	156.5	8.2
15	243.4	11.6	140.4	6.7
16	357.3	17.9	281.6	14.1
17	295.4	14.1	251.2	12.0
18	219.4	10.0	163.8	7.4
19	216.4	9.4	183.9	8.0
20	282.6	12.3	216.4	9.4
TOTAL	4742.4	232.6	3616.2	177.2

Table 10

Grams of Five Cooked Vegetables Selected and Consumed

by Twenty-Four Nursery School Children

During the Noon Meal for a Period of Twenty Days

Day	Selected		Consumed	
	Total	Mean	Total	Mean
1	95.1	4.7	46.5	2.3
2	143.7	7.6	30.9	1.6
3	79.5	4.2	29.1	1.5
4	12.0	0.6	4.4	0.2
5	10.6	0.5	0.9	0.0
6	31.2	1.6	1.1	0.0
7	68.1	3.4	18.0	0.9
8	36.8	1.8	4.1	0.2
9	96.8	4.8	38.7	1.9
10	137.6	6.2	58.3	2.6
11	88.2	4.0	22.1	1.0
12	24.5	1.2	7.8	0.4
13	49.5	2.6	41.3	2.2
14	23.0	1.2	6.9	0.4
15	167.4	8.0	70.9	3.4
16	14.9	0.7	14.9	0.7
17	82.9	3.9	26.1	1.2
18	56.6	2.6	37.7	1.7
19	26.7	1.2	7.8	0.3
20	37.0	1.6	9.0	0.4
TOTAL	1282.1	62.4	476.5	22.9

Table 11

Grams of Seven Cooked Vegetables Selected and Consumed

by Twenty-Four Nursery School Children

During the Noon Meal for a Period of Twenty Days

Day	Selected		Consumed	
	Total	Mean	Total	Mean
1	314.0	15.7	217.8	10.9
2	311.7	16.4	150.6	7.9
3	275.3	14.5	160.1	8.4
4	288.3	15.2	226.1	11.9
5	248.6	12.4	209.9	10.5
6	318.2	16.7	224.2	11.8
7	333.6	16.7	281.9	14.1
8	258.4	12.9	199.5	10.0
9	355.3	17.8	241.3	12.1
10	436.4	19.8	316.3	14.4
11	423.0	19.2	301.8	13.7
12	333.7	16.7	273.4	13.7
13	259.9	13.7	197.0	10.4
14	276.5	14.5	235.3	12.4
15	471.4	22.4	347.9	16.6
16	325.4	16.3	212.5	10.6
17	532.9	25.4	426.1	20.3
18	337.0	15.3	267.1	12.1
19	353.1	15.3	281.9	12.2
20	358.7	15.6	280.0	12.2
TOTAL	6811.4	332.5	5050.7	246.2

Table 12

Grams of Raw and Cooked (7) Vegetables Selected and Consumed

by Twenty-Four Nursery School Children

During the Noon Meal for a Period of Twenty Days

Day	Selected		Consumed	
	Total	Mean	Total	Mean
1	502.2	25.1	362.0	18.1
2	525.2	27.6	290.0	15.3
3	621.9	32.7	429.3	22.6
4	403.6	21.2	316.2	16.6
5	363.4	18.2	288.8	14.4
6	562.1	29.6	415.0	21.8
7	607.8	30.4	499.1	24.9
8	503.4	25.2	387.1	19.3
9	532.5	26.6	367.8	18.4
10	716.3	32.5	528.1	24.0
11	653.3	29.7	466.7	21.2
12	641.8	32.1	526.2	26.3
13	441.0	23.2	346.0	18.2
14	486.3	25.6	391.8	20.6
15	714.8	34.0	488.3	23.2
16	682.7	34.1	494.1	24.7
17	828.3	39.4	677.3	32.2
18	556.4	25.3	430.9	19.6
19	569.5	24.8	465.8	20.2
20	641.3	27.9	496.4	21.6
TOTAL	11553.8	565.2	8666.9	423.2

Table 13

Grams of Green Beans Selected and Consumed by Twenty-Four Nursery School Children during the Noon Meal for a Period of Twenty Days

Day	Selected		Consumed	
	Total	Mean	Total	Mean
1	84.8	4.2	66.5	3.3
2	74.0	3.9	60.7	3.2
3	105.3	5.5	65.2	3.4
4	140.4	7.4	129.4	6.8
5	134.0	6.7	106.0	5.3
6	135.0	7.1	101.3	5.3
7	139.5	7.0	137.9	6.9
8	93.8	4.7	84.6	4.2
9	158.4	7.9	119.0	5.9
10	146.0	6.6	141.4	6.4
11	156.6	7.1	153.4	7.0
12	190.8	9.5	150.9	7.5
13	90.0	4.7	60.0	3.1
14	166.5	8.8	157.3	8.3
15	224.4	10.7	218.6	10.4
16	148.5	7.4	76.6	3.8
17	315.7	15.0	282.7	13.5
18	131.0	5.9	106.5	4.8
19	184.8	8.0	166.6	7.2
20	195.0	8.5	164.5	7.1
TOTAL	3014.5	146.6	2549.1	123.4

Table 14

Grams of Green Peas Selected and Consumed

by Twenty-Four Nursery School Children

During the Noon Meal for a Period of Twenty Days

Day	Selected		Consumed	
	Total	Mean	Total	Mean
1	134.1	6.7	104.8	5.2
2	94.0	4.9	59.0	3.1
3	90.5	4.8	65.8	3.5
4	135.9	7.1	92.3	4.8
5	104.0	5.2	103.0	5.1
6	152.0	8.0	121.8	6.4
7	126.0	6.3	126.0	6.3
8	127.8	6.4	110.8	5.5
9	100.1	5.0	83.6	4.2
10	152.8	6.9	116.6	5.3
11	178.2	8.1	126.3	5.7
12	118.4	5.9	114.7	5.7
13	120.4	6.3	95.7	5.0
14	87.0	4.6	71.1	3.7
15	79.6	3.8	58.4	2.8
16	162.0	8.1	121.0	6.0
17	134.3	6.4	117.3	5.6
18	149.4	6.8	122.9	5.6
19	141.6	6.1	107.5	4.7
20	126.7	5.5	106.5	4.6
TOTAL	2514.8	122.9	2025.1	98.8

Table 15

Grams of the Raw Vegetables Selected from Each Position by Twenty-Four Nursery School Children During the Noon Meal for the Period of Twenty Days

Position							
ONE		TWO		THREE		FOUR	
Total	Mean	Total	Mean	Total	Mean	Total	Mean
243.9	12.8	188.2	9.4	213.5	11.2	230.3	10.5
274.2	13.7	346.6	18.2	115.3	6.1	308.1	15.4
357.3	17.9	181.1	9.5	114.8	5.7	219.4	10.0
295.4	14.1	209.8	11.0	245.0	12.2	216.4	9.4
		243.4	11.6	177.2	8.9	282.6	12.3
				279.9	12.7		
TOTAL							
1170.8	58.5	1169.1	59.7	1145.7	56.8	1256.8	57.6

Table 16

Grams of the Raw Vegetables Consumed from Each Position by Twenty-Four Nursery School Children During the Noon Meal for the Period of Twenty Days

Position							
ONE		TWO		THREE		FOUR	
Total	Mean	Total	Mean	Total	Mean	Total	Mean
190.8	10.0	144.2	7.2	139.4	7.3	164.9	7.5
217.2	10.9	269.2	14.2	90.1	4.7	252.8	12.6
281.6	14.1	149.0	7.8	78.9	3.9	163.8	7.4
251.2	12.0	156.5	8.2	187.6	9.4	183.9	8.0
		140.4	6.7	126.5	6.3	216.4	9.4
				211.8	9.6		
TOTAL							
940.8	47.0	859.3	44.1	834.3	41.2	981.8	44.9

Table 17

Grams of the Five Cooked Vegetables Selected from Each Position by Twenty-Four Nursery School Children During the Noon Meal for the Period of Twenty Days

Position							
ONE		TWO		THREE		FOUR	
Total	Mean	Total	Mean	Total	Mean	Total	Mean
143.7	7.6	12.0	0.6	79.5	4.2	95.1	4.7
96.8	4.8	31.2	1.6	24.5	1.2	10.6	0.5
88.2	4.0	36.8	1.8	49.5	2.6	68.1	3.4
		14.9	0.7	167.4	8.0	137.6	6.2
		82.9	3.9	37.0	1.6	23.0	1.2
		56.6	2.6				
		26.7	1.2				
TOTAL							
328.7	16.4	261.1	12.4	357.9	17.6	334.4	16.0

Table 18

Grams of the Five Cooked Vegetables Consumed from Each Position by Twenty-Four Nursery School Children During the Noon Meal for the Period of Twenty Days

Position							
ONE		TWO		THREE		FOUR	
Total	Mean	Total	Mean	Total	Mean	Total	Mean
30.9	1.6	4.4	0.2	29.1	1.5	46.5	2.3
38.7	1.9	1.1	0.0	7.8	0.4	0.9	0.0
22.1	1.0	4.1	0.2	41.3	2.2	18.0	0.9
		14.9	0.7	70.9	3.4	58.3	2.6
		26.1	1.2	9.0	0.4	6.9	0.4
		37.7	1.7				
		7.8	0.3				
TOTAL							
91.7	4.5	96.1	4.3	158.1	7.9	130.6	6.2

Table 19

Grams of the Seven Cooked Vegetables Selected from Each Position by Twenty-Four Nursery School Children During the Noon Meal for the Period of Twenty Days

Position							
ONE		TWO		THREE		FOUR	
Total	Mean	Total	Mean	Total	Mean	Total	Mean
311.7	16.4	288.3	15.2	275.3	14.5	314.0	15.7
355.3	17.8	318.2	16.7	333.7	16.7	248.6	12.4
423.0	19.2	258.4	12.9	259.9	13.7	333.6	16.7
		325.4	16.3	471.4	22.4	436.4	19.8
		532.9	25.4	358.7	15.6	276.5	14.5
		337.0	15.3				
		353.1	15.3				
TOTAL							
1090.0	53.4	2413.3	117.1	1699.0	82.9	1609.1	79.1

Table 20

Grams of the Seven Cooked Vegetables Consumed from Each Position by Twenty-Four Nursery School Children During the Noon Meal for the Period of Twenty Days

Position							
ONE		TWO		THREE		FOUR	
Total	Mean	Total	Mean	Total	Mean	Total	Mean
150.6	7.9	226.1	11.9	160.1	8.4	217.8	10.9
241.3	12.1	224.2	11.8	273.4	13.7	209.9	10.5
301.8	13.7	199.5	10.0	197.0	10.4	281.9	14.1
		212.5	10.6	347.9	16.6	316.3	14.4
		426.1	20.3	280.0	12.2	235.3	12.4
		267.1	12.1				
		281.9	12.2				
TOTAL							
693.7	33.7	1837.4	88.9	1258.4	61.3	1261.2	62.3